Resource 6: “Hook” for SBI 3U1 Genetic Processes

Category: Basic Concepts of Science

Extracting DNA from Strawberries

Big Idea

Variability and diversity of living organisms result from the distribution of genetic materials during the process of meiosis.

Learning Goals

* Examine what DNA looks like once extracted from strawberries
* Learn the scientific procedure behind DNA extraction
* Understand the purpose of each of the materials in DNA extraction

Ministry Expectations

Overall:

D3. demonstrate an understanding of concepts, processes, and technologies related to the transmission of hereditary characteristics

A1. demonstrate scientific investigation skills (related to both inquiry and research) in the four areas of skills (initiating and planning, performing and recording, analysing and interpreting, and communicating)

Specific:

D3.2 explain the concepts of DNA, genes, chromosomes, alleles, mitosis, and meiosis, and how they account for the transmission of hereditary characteristics according to Mendelian laws of inheritance

A1.1 formulate relevant scientific questions about observed relationships, ideas, problems, or issues, make informed predictions, and/or formulate educated hypotheses to focus inquiries or research

Teacher Background:

The following are important points to emphasize when completing the procedure and leading the group discussion.

* Cells are broken by smashing strawberries
* Detergent dissolves cell and nuclear membranes since these are made of lipids
* Salt is added to detergent solution to match osmolarity of cells
* Mixture is filtered through paper towels to remove large pieces
* DNA is soluble in water but NOT in alcohol, therefore the addition of alcohol causes the DNA to clump and allows for collection

Materials:

For EACH student:

* 1 strawberry
* Ziploc bag
* 1 15 ml centrifuge tube
* 1 test tube
* 1 piece of paper towel
* 10 ml extraction buffer (PREPARE AS SHOWN BELOW)
* 1 glass stirring rod
* 1 microcentrifuge tube

Extraction Buffer Recipe

* 450 ml distilled water
* 10 g table salt
* 50 ml Dawn dishwashing detergent

For class to share:

* clean bowl
* 90% ice cold rubbing alcohol or ethanol
* eye droppers for dispensing solutions

Procedure

Before Class:

1. Collect all materials
2. Wash strawberries and remove green stems
3. Prepare extraction buffer
4. Place alcohol on ice

Monitor Students as they complete the following:

1. Place a strawberry in the Ziploc bag, squeeze out the air and seal the bag. Using your hands, crush the strawberry into juice and pulp while being careful not to puncture the bag.
2. Open the bag and add 10 ml of extraction buffer (measured with 10 full eyedroppers). Seal the bag and GENTLY mix the strawberry juice with the buffer.
3. Create a filtration system by wrapping the paper towel around your finger and placing your paper towel-wrapped finger into the 15 ml tube. Remove your finger to reveal a well in which the juice can be poured.
4. Pour the strawberry juice mixture into the well in the paper towel. Allow the juice to drip through the paper towel for 3-5 minutes.
5. Throw out the paper towel and the Ziploc bag.
6. Transfer the liquid from the 15 ml tube into the test tube until the test tube is around ONE THIRD full.
7. Slowly add 3 ml of ice cold alcohol (using eyedroppers) into the test tube. The alcohol should trickle down the side of the test tube. You should now have a red bottom layer, and a clear top layer.
8. Observe the clear top layer for 2-3 minutes for any changes occurring.
9. Insert a stirring rod into the tube and swirl around. This will spool the DNA around the stick. Pull the DNA out of the tube where you may observe and touch. DNA can be stored in a microcentrifuge tube filled with alcohol.
10. If desired, attach a string to the microcentrifuge tube to keep DNA on a necklace!
11. Clean work area and think about the following questions.

Assessment of Activity

Group discussion using THINK PAIR SHARE in order to answer the following questions which will provide an introduction to genetics, scientific experimentation and scientific thinking.

**QUESTIONS and ANSWERS FOR GROUP DISCUSSION**

* Did the DNA extracted look similar to what you predicted before the procedure?
  + Many answers, based on individual prediction
* Why is it necessary to mash the strawberries?
  + Break the cells
* What is the purpose of the detergent?
  + Dissolves cell and nuclear membranes
* What is the purpose of the salt?
  + Maintains buffer at same osmolarity as cells
* Is the DNA that you extracted pure? What else might be attached to the DNA?
  + No, many answers
* Why might some people get more DNA than others?
  + Based on size of strawberry, how accurate procedure was followed

Source: http://www.mysciencebox.org/book/export/html/320